

## **Update to the CHE Response to the 2013 Report of the Committee of Visitors October 31, 2015**

The Division of Chemistry (CHE) wishes to thank the members of the 2013 COV panel for their time and effort on the review of the activities of the Division. We are especially grateful to Dr. Joseph Francisco for his exemplary leadership during the COV process, resulting in the timely completion of the final report. In the following, we respond to the specific recommendations in the same order as presented in the executive summary of the report. If deemed necessary for clarification, passages from the full report are quoted.

"Recommendation #1: Find mechanisms to further increase the efficiency and efficacy of the review process. These efforts should include establishing a database of reviewers and developing mechanisms for educating the reviewer pool on the importance of substantive reviews and reviews that provide constructive advice to PIs. An essential aspect of this recommendation is to increase the clarity, transparency and integrity of the review process, particularly with respect to communication to PI's. Two examples are transparency in identification and development of priority research areas and clarification of broader impacts. The Broader Impact criterion is an important component of competitive proposals, but there remains misunderstanding on what it is and how it is used in evaluation. Moreover, evaluation of the broader impact component should be consistent across programs of the Division. Finally, the Chemistry Division should continue its efforts to ensure that the composition of review panels is as diverse as possible, including members with high levels of research activity and breadth, as well as young PIs."

"...establishing a database of reviewers"

### **Update October 2015**

The Division of Chemistry (CHE) is now exploring several reviewer databases: the CHE-implemented reviewer database, the National Institutes of Health (NIH) Query, View, and Report (QVR) System, and the NSF-wide PRIM system.

As stated in the April 2014 COV update, the Division has, over the last year, collected volunteer reviewers from a survey that is linked to our CHE website. The reviewers enter their own contact information, including optional demographic data, the programs they are interested in serving, and their expertise with up to 10 keywords. The Division has advertised the opportunity to sign-up as a CHE reviewer using this survey at local, regional, and national meetings as well as in our Divisional Newsletter. Currently, our reviewer database contains over 8,000 names and the Program Officers consult the listing frequently to include new reviewers and to broaden the participation of underrepresented groups in the review process for all of our programs.

In addition to the CHE Reviewer Database, the Division is also leading a pilot program using a reviewer database imported from the National Institutes of Health (NIH) called Query, View, and Report (QVR). QVR allows Program Officers to search, view, and retrieve detailed information about grant applications and awards. QVR integrates information from NIH's databases of information on extramural applications, awards, and financial obligations, as well as the National Library of Medicine's PubMed (a database of indexed journal citations and abstracts). QVR is capable of finding scientifically similar projects, people, or publications related to one or more targeted proposals or manually entered text (such as from a publication or program announcement) using the various "like" functionalities. CHE is one of the first testers of the

QVR system at NSF and, while still in the early stages of adoption, the CHE Program Officers report good progress in learning to use the system.

NSF is also developing the Panel and Reviewer Information Management (PRIM) system, which is a reviewer database and panel management system. The reviewer database is searchable by several criteria, including areas of expertise identified by CHE and reviewer demographics. PRIM currently has over 8000 chemistry reviewers, including all who have reviewed for CHE programs for the last four years, all who were in the old CHE database (which was difficult to use and maintain and is no longer functional), and all who volunteered to review by submitting information to the chemistry webpage. New reviewers can be added easily by NSF staff, and one significant advantage of the PRIM database is that it can be readily updated by the reviewers themselves. On an annual basis, the Division sends out instructions to all reviewers to ask them to re-examine their profile, so that new reviewers can enter their complete profile and other reviewers can update their profiles.

The Chemistry Division is enthusiastic about both the QVR and PRIM tools as means of facilitating reviewer/panelist selection that will be both topically relevant and will broaden the participation of diverse groups in the review process.

#### "... developing mechanisms for educating the reviewer pool"

##### **Update October 2015**

The CHE Outreach Working Group was charged with developing plans and materials for reaching out to and educating the scientific community on issues such as NSF programs and opportunities, the review process, how to become a reviewer, etc. Using some additional travel funds available in FY 2015, members of CHE gave presentations at the:

- Joint Great Lakes/ Central Regional ACS Meeting in Grand Rapids, MI; May 27-30, 2015;
- Northwest Regional ACS Meeting in Pocatello, ID; June 21-24, 2015;
- 250<sup>th</sup> National American Chemical Society (ACS) Meeting in Boston, MA; August 16-20, 2015; and
- Annual Conference of the National Organization for the Professional Advancement of Black Chemists and Chemical Engineers (NOBCChE) in Orlando, Florida; September 21-25, 2015.

Notably, our outreach activities at the National ACS Meeting in Boston were exceptionally well attended with over 250 one-on-one discussions as part of the "Speed Coaching" Program organized by CHE and manned by our Program Officers and others from the NSF Divisions of Materials Research (DMR) and Chemical, Bioengineering, Environmental and Transport Systems (CBET) as well as NIH, the Department of Energy (DOE), the Environmental Protection Agency (EPA), and the Air Force Office of Scientific Research (AFOSR).

In the Spring of 2016, CHE will support, for the first time, an Early Career Workshop for pre-tenure faculty and senior postdocs to talk about the NSF review process as it relates to the CAREER Program and other funding opportunities. The Workshop will offer mock panels, the review of short white papers, discussion of the broader impacts criteria, and the ability for less experienced investigators to get direct feedback from established investigators and CHE Program Officers.

CHE continues to provide briefings before each virtual and/or in-person panel with regard to broadening participation and mitigating bias during the proposal evaluation processes. Initially instituted by the Chemistry Division in 2006 as a response to the NSF, DOE, and NIH-sponsored "Workshop on Building Strong Academic Chemistry Departments through Gender Equity", the presentation is updated annually with new data. This presentation of best practices has been shared throughout the Foundation and is now used (in some form) in training all CHE panelists as well as program staff and reviewers from several other NSF directorates.

"...transparency in identification and development of priority research areas and clarification of broader impacts..."

#### **Update October 2015**

As noted above, the Division has made strong efforts to reach out to the scientific community locally, regionally, and nationally to inform them about funding opportunities and priority research areas as well as to clarify the broader impacts merit review criterion.

CHE's efforts to be transparent in identifying and developing priority research areas is illustrated in the following example on the Innovations at the Nexus of Food, Energy and Water Systems (INFEWS) Initiative. Similar efforts also apply to other recent initiatives and investment areas such as SusChEM, Understanding the Brain, etc.

In FY 2014, the Directorate of Mathematical and Physical Sciences (MPS) Advisory Committee (MPS AC) charged a Subcommittee on Food Security to identify the current technology gaps that can be addressed by NSF / MPS. The Subcommittee evaluated all aspects of food production, especially noting the inextricable roles of water and energy in food production. Six priority areas were identified in their report, "Food, Energy, and Water: Transformative Research Opportunities in the Mathematical and Physical Sciences," which was been posted on the MPS and CHE websites:

[https://nsf.gov/mps/advisory/mpsac\\_other\\_reports/subcommittee\\_report\\_food\\_water\\_energy\\_nexus\\_final.pdf](https://nsf.gov/mps/advisory/mpsac_other_reports/subcommittee_report_food_water_energy_nexus_final.pdf).

The MPS AC Subcommittee report was widely distributed and formed the basis for the second phase of community engagement - the NSF-wide Dear Colleague Letter (DCL): SEES: Interactions of Food Systems with Water and Energy Systems (NSF 15-040) - which was published on Feb. 2, 2015. This DCL asked for supplements, conference/workshop proposals, and Early Concept Grants for Exploratory Research (EAGER) proposals to stimulate debate, discussion, visioning, and collaboration across research communities to enable a higher appreciation and understanding of food systems and their couplings to energy and water systems. Four workshops were supported by CHE:

Addressing the Scientific, Technological and Societal Challenges of the Energy, Water, and Food (FEW) Nexus: Enabling Resiliency in Energy, Water, and Food Systems for Society; April 16-17, 2015, Tucson, AZ

FEW NSF Workshop: Closing the Human Phosphorus Cycle; June 8-9, 2015, Arlington, VA

FEW NSF Workshop: Food-Energy-Water Systems Challenging Chemists and Chemical Engineers in the 21st Century; October 14-15, 2015, Arlington, VA

FEW NSF Workshop: Grand Challenges in the Nitrogen Cycle; November 9-10, 2015, Arlington, VA

The FEW workshop reports have been (or will be, as they become available) linked on the CHE website, highlighted in email blasts to the CHE community and in our Divisional Newsletter, and discussed at our outreach events. These efforts were initiated in order to engage increasingly broader sections of the scientific communities.

The MPS AC Subcommittee Report and FEW Workshops were then used in the summer of 2015 to inform the Dear Colleague Letter: FY 2016 Innovations at the Nexus of Food, Energy and Water Systems (INFEWS) Funding Opportunity on Nitrogen, Phosphorus, and Water (NSF 15-108). Additional INFEWS solicitations/DCLs are envisioned for FY 2016.

By engaging the MPS AC Subcommittee, workshop participants, and the broader scientific community through outreach events, the CHE Newsletter/emails, and posts on the CHE website, the Division tries to transparently identify and develop priority research areas for both the Division and Foundation. Again, the above INFEWS Initiative represents but one example of the way initiatives are advanced with the community's input. The Division is responsive to initiatives from the scientific community (bottom up) as well as from the Executive and Legislative Branches of the Federal Government (top down).

"...evaluation of the broader impact component should be consistent across programs of the Division"

#### **Update October 2015**

The Division continues to try to address both of the NSF merit review criteria (intellectual merits and broader impacts), how the criteria relate to one another, and how to evaluate them. Our most recent efforts have largely been dictated by changes occurring at NSF as a whole. For example, there have been several relatively recent changes to the NSF Grant Proposal Guide (GPG) to implement the National Science Board's recommendations as given in their report entitled, "National Science Foundation's Merit Review Criteria: Review and Revisions". The GPG changes have included a renaming of the review criteria to Merit Review Principles and Criteria and a redefinition of the three guiding review principles, two review criteria and five review elements.

In addition to clarifying the language on broader impacts and how they are to be evaluated, the NSF issued "Perspectives on Broader Impacts" (NSF 15-008, [http://www.nsf.gov/od/oia/publications/Broader\\_Impacts.pdf](http://www.nsf.gov/od/oia/publications/Broader_Impacts.pdf)) which gives examples of broader impacts activities that are focused on education / outreach, that are intrinsic to the research itself, and that interweave or closely conjoin education / outreach with the research itself.

In October 2015, MPS engaged its Advisory Committee in a discussion of broader impacts and concluded that a deliberately non-prescriptive approach may benefit the community as it allows for a variety of responses, and ultimately, the highest level of creativity in satisfying the review criteria.

The Division appreciates the desire of the chemical community for a consistent evaluation of broader impacts and therefore, we have continued to discuss this issue with new Program Officers, to stress the importance of addressing both intellectual merits and broader impacts to reviewers/panelists, and to help principal investigators in developing plans that respond to the

NSB / NSF criterion through workshops (e.g., Early Career Workshop), meetings (e.g., ACS National Meeting speed coaching sessions) and other outreach activities.

"...composition of review panels is as diverse as possible"

#### **Update October 2015**

As noted previously, the Division is continuing its efforts to broaden participation in the review process through our outreach activities and by enhancing our reviewer databases. This specifically includes early career investigators (young investigators) who are training in grantsmanship and the review processes via our upcoming Early Career Workshop.

"Recommendation #2: Maintain continuity of Program Officers in programs over a period of time."

#### **Update October 2015**

In 2014, both the CHE Division Director (DD) and Deputy Division Director (DDD) left the Foundation within a short period of time. In response to these unanticipated departures, former rotators were called upon to fill the gaps in leadership on very short notice. The Division is extremely grateful to Steve Bernasek and David Berkowitz for being willing to serve as DD in CHE, each for a six month term (July 2015 – January 2015 and February 2015-August 2015, respectively). The Division also thanks Linda Sapochak from the Division of Materials Research for serving as the Acting Deputy Division Director while CHE conducted a search for the new (rotating) DD and (permanent) DDD. The Division is very pleased to announce that Angela Wilson will be joining CHE in March 2016 as the new DD and Carol Bessel rejoined CHE (after a detail in DMR) as the permanent DDD in April 2015.

With senior leadership again established, the Division has resumed rotator recruitment and has brought aboard four new Program Officers and one Detailee (from the Geosciences Directorate) since January 2015. Generally, rotators serve the Foundation for two-year terms. With ten rotator positions in the Division, this means that each year CHE must replace 5-6 rotators. To do this effectively and efficiently, the Division has become more proactive in recruiting rotators – advertising at local, regional, and national meetings and conferences; talking with panelists about serving at the Foundation; publishing Dear Colleague Letters; sending email blasts and the CHE Newsletter; and frequently updating our Divisional website. We find that “cold calls” based on Program Officer recommendations are the currently the most effective tool to fill our specific recruitment needs.

In October 2015, the Division decided to recruit once again for permanent Program Officers (the last permanent PD was hired in 2014). If successful, the Division will maintain a 60:40 ratio of permanent to rotator technical staff. We are very cognizant of the need for continuity in the Program Lead position and are striving to maintain consistency in the face of departures and retirements. To provide additional continuity within the programs we have discontinued the rotation of the professional/administrative staff. Each program is now assigned a dedicated Program Specialist. This change provides the programs with more continuity in terms of answering the investigators', panelists', and community's questions.

"Recommendation #3: Increase the efficiency of operations and the number of Program Officers to improve program management. The COV recommends that the Division be given positions for additional personnel in order to decrease the workload currently imposed on Division staff, to ensure adequate oversight and program management, and to allow progress on new and existing programs and projects."

#### **Update October 2015**

While we agree with this recommendation, Full Time Equivalents (FTEs) are centrally controlled and have not increased with increasing proposal pressure across the Foundation. This means that we have not been able to obtain additional staff positions at any level. As noted above, we have become more proactive in ensuring the Division is fully-staffed at all times.

We have recently attracted an American Association for the Advancement of Science (AAAS) Fellow to assist in portfolio review, program assessment, and community engagement (especially with regard to the Brain Initiative). Her assistance is highly valued.

In addition, the Division continues to expand and redefine the roles of our Program Specialists and Student Assistant by shifting selected administrative responsibilities from the Program Officers to the professional staff. These duties have included: data queries, panel orientation, outreach activities, program officer training, external communications, and review of carefully chosen aspects of the annual reports. The ability to share some Program Officer duties has lightened the workloads of our technical staff, enriched the skill sets of our administrative staff, and strengthened the collaborative interactions within the Division.

"Recommendation #4: Reevaluate the distinction between the catalysis and synthesis programs and investigate best ways to categorize the programs in these areas."

#### **Update October 2015**

In the last year, Program Officers in both the Chemical Synthesis (SYN) and Chemical Catalysis (CAT) Programs have worked diligently to clarify the distinctions between the two programs. Program descriptions have been revised on the CHE website and we have arranged the program assignments so that at least one Program Officer (often a rotator) is assigned to both the SYN and CAT programs. This "overlapping" Program Officer develops an intimate knowledge of both portfolios and can advise proposers of the differences between programs while also reviewing incoming proposals for significant overlaps in goals and aims.

The SYN and CAT Programs have also, in the past year, held a joint review panel for proposals that were viewed as straddling the two program descriptions. This joint panel was enthusiastically received by panelists as it ensured that proposers could submit their best ideas for a fair, comprehensive review without worrying about fitting their research to a specific program description. Proposals are seamlessly transferred between the programs and the best projects at the SYN / CAT interface are co-funded by both programs – benefiting from their interdisciplinarity. Notably, while the Division customarily receives and reviews nearly 2,000 proposals each year, the proposals identified as having goals at the SYN /CAT interface represented only about 20 proposals (5-6% of the total number of CAT and SYN proposals). The Division finds this interface percentage acceptable and on par with other program interfaces in the Division and within NSF.

Finally, both the CAT and SYN Programs have held (or are planning) community workshops that further define the distinct grand challenges for each program. A workshop report



sponsored by the CAT Program on the topic of "Base Metal Catalysis" has been posted on the CHE website:

[http://www.nsf.gov/mps/che/workshops/2013\\_catalysis\\_workshop\\_report\\_final.pdf](http://www.nsf.gov/mps/che/workshops/2013_catalysis_workshop_report_final.pdf). A SYN Workshop on novel opportunities and challenges in the field is in planning for spring 2016.

***"Recommendation #5: Reevaluate the timing of the submission windows."***

**Update October 2015**

NSF currently receives one-year funding and runs on a fiscal year (FY) calendar (October 1 - Sept. 30) that requires all award recommendations to be processed by early August (with very rare exceptions). To ensure the efficient processing of award recommendations, these factors require that NSF receive budget inputs in a timely manner. In the last few years, the Division has been constrained by when our budgets actually became known and available. A change in the CHE submission window – especially to later dates in the calendar year – would exacerbate the challenges faced by Program Officers in getting reviewer input and making well-considered recommendations on proposal submissions.

As noted in the previous update, the move to the Fall submission windows for the regular individual investigator and small group proposals was prompted by the realities of the Federal budget process (mentioned above) and our desire to align the submission windows with our most active co-funding partners: the Divisions of Materials Research (DMR); Molecular and Cellular Biology (MCB); and Chemical, Bioengineering, Environmental and Transport Systems (CBET). The Division regularly shares proposals within NSF in order to provide the most comprehensive reviews possible. Often sharing proposals leads not only to co-reviewing, but also to co-funding. Because our windows are now well aligned with our biggest internal collaborators, the Division was able to obtain co-funding for 92 CHE-submitted awards leveraging an additional \$12.1 million for chemistry research (note: this does not include EPSCoR or international co-funding). The Division sees this as a significant benefit for the entire chemistry community.

***"Recommendation #6: Commission a National Academies review/study of the Re-alignment of the Chemistry Division. The composition of the review should represent a broad cross-section of the chemistry community (i.e. industry, government laboratories, and universities). The COV has provided specific scope questions to guide the assessment."***

**Update October 2015**

The Division thanks the 2013 COV for their thoughtful response on ways in which the realignment could be assessed.

The Division's five years of experience with the realignment has indicated that the initial positive feedback has been reaffirmed the community. Apart from the COV's comments about the distinction between the CAT and SYN Programs (addressed above), CHE has not received any appreciable uptick in concern about proposal "homes" or management relative to our previous programs (organic, inorganic, physical and analytical chemistry). Given the general positive assessment, the advantages brought by strengthening our collaborative interactions with other Divisions / Directorates and agencies (especially with regard to recent initiatives like Understanding the Brain, INFEWS, DMREF and others), our increased ability to respond to initiatives, and the high cost, time, and effort that would need to be devoted to a National Academy of Sciences study, a review of the realignment does not seem warranted at this time.

Obtaining a fair and thorough review for proposals is a concern shared by the entire scientific community. That said, the Division will continue to evaluate our current portfolio both internally (with shared Program Officers in each program), and externally (via workshops within the community). We have already made small but important changes to the program descriptions of the SYN and CAT Programs (see Recommendation #4), and have separated the Chemical Structure, Dynamics and Mechanisms Program into A and B subprograms (as these provide more reasonably sized and differentiated portfolios). Careful and consistent Program Officer training has encouraged the technical staff to work together to ensure that all proposals submitted to the Division find their best home for review or are shared between programs, when warranted.

**"Recommendation #7: Work to increase more industrial partnerships. The division should consider (a) using Centers to even more effectively to bring about university/industry engagement, and (b) examining best practices at NSF to help facilitate faculty/industry partnerships using NSF-facilitated internships.** It is important that the strength in fundamental research in the chemical sciences continue to further innovation, and the Chemistry Division can provide leadership to the community in identifying and promulgating successful industry/university collaboration mechanisms."

#### **Update October 2015**

The Division has recently undertaken a suite of activities designed to increase industrial partnerships both within NSF and within the community that we serve.

For example, since 2009 the Division has leveraged the Centers for Chemical Innovation (CCIs) Program to enhance university/industry engagement. The CCIs have spun-out six small businesses, employing more than 60 people in four states. In addition, there are numerous collaborations with the private sector that have led to patents, commercially available materials, instrument prototypes, and licenses for large-scale chemical processes. A few examples of innovation that has been supported (in whole or in part) by the CCI Program include:

- New plasma ion sources developed for the analysis of complex mixtures by Center for Chemical Evolution researchers are now being used for the detection of counterfeit medicines in collaboration with The Global Fund, a Swiss foundation that provides resources to treat and minimize the spread of diseases (including HIV, tuberculosis, and malaria) in third world countries.
- A (confidential) licensing option to a start-up company in California has been issued by the University of North Carolina at Chapel Hill as part of the efforts within the Center for Enabling New Technologies through Catalysis. This option provides a means to scale-up and explore the homogeneous process for the important transformation of ethylene to p-xylene.
- The Center for Sustainable Materials Chemistry has spun-off the Inpria Corporation, a pioneer in extending semiconductor lithography with inorganic photoresists for nanoscale patterning. Inpria's patented photo-condensed molecular oxides enable advanced performance with simplified processing. Inpria raised approximately \$15 million through a consortium of semiconductor manufacturers led by Intel Capital, Samsung, and Applied Materials. Additional investments have been made by the Oregon Angel Fund and the NSF SBIR program.

With a focus on the element of NSF's mission which targets preparation of a "well-prepared knowledge workforce", CHE issued a Dear Colleague Letter: Graduate Education in Chemistry



(NSF 15-055) which sought to facilitate the research training of graduate students in Masters and Doctoral programs for careers in a broad range of fields (not only academics). Through this DCL, the Division invited the community to help develop plans for alternative approaches to research and graduate education by submitting proposals for workshops (conferences). A workshop is currently in planning to bring together educators and industry representatives to address the content of the graduate curriculum as it relates to industrial employment opportunities as well as to assess the possibilities of supporting graduate education in new ways (e.g., industrial internships at the graduate student level).

In addition, this year, the MPS and the Directorate for Social, Behavioral and Economic Sciences (SBE) have been joined by the National Institute of Justice (NIJ) as co-sponsors supporting planning for one or more Industry/University Cooperative Research Centers (I/UCRCs) in the area of forensic science. The I/UCRC Program supports long-term partnerships among industry, academia, and government targeting pre-competitive research in areas of shared interest. The centers are catalyzed by a relatively small investment from NSF. Their research is primarily funded by center members, with NSF playing a supporting role in the development, evolution, and evaluation of the center. The I/UCRC Program has its roots in the Engineering Directorate, and has long record of fostering collaborations; the forensics effort constitutes the first MPS entry into this arena.

Finally, the Division recently held a Workshop on “Data-Rich Organic Chemistry: Enabling and Innovating the Study of Chemical Reactions”, see: [http://www.nsf.gov/mps/che/workshops/data\\_rich\\_chemistry\\_report\\_april\\_2015.pdf](http://www.nsf.gov/mps/che/workshops/data_rich_chemistry_report_april_2015.pdf). The workshop engaged a diverse group of chemists and engineers from academia, pharma, and the analytical instrumentation industries, as well as from the government/nonprofit sector to discuss the current state of industry/academic collaborative research and opportunities for enhancing the contributions of precompetitive collaborations toward solutions to current problems. Key challenges highlighted the need to develop a coherent vision for a common data framework, to understand the landscape for new data-rich technologies, and to align future priorities from industry, academia, and government perspectives.

**"Recommendation #8: Explore ways to increase global engagement of the chemistry community, especially faculty and students involved in projects in other countries. CHE should seek to enhance participation in international collaborations by creating a chemical research world network of partnering agencies who share the CHE vision of a joint proposal-joint review-joint funding recommendation-parallel funding model. Exploring best practices from the Materials World Network (DMR) could provide direction on how to be effective in increasing global partnerships by the Chemistry Division."**

#### **Update October 2015**

After several years, CHE undertook an internal assessment of the International Collaborations in Chemistry (ICC) Program and decided to suspend the activity due to concerns from the international community about unfulfilled expectations with regard to funding rates, community unhappiness with regard to multiple awards for some investigators, and difficulties in managing the associated Program Officer workload. These issues were similar to those experienced with the DMR Materials World Network and also caused a suspension of their program.

In order to continue to facilitate collaboration between U.S. and international partners who have complementary strengths and common interests, the Division now issues an annual e-mail for supplemental funding opportunities to all current CHE awardees. The supplement requests are

asked to address two criteria: true intellectual collaboration with foreign research partner and the benefit to the U.S. community from access to the expertise, facilities, or resources of the international collaborator. In FY 2015 the Division funded 48 international supplemental requests (totaling approximately \$1 million) with considerable co-funding leverage from the Office of International Science and Engineering. The funded supplements supported U.S. students, postdocs and faculty traveling to countries that were represented in the ICC Program (e.g., Germany, Brazil, Israel, France, and Japan) as well as many countries that were not officially involved in the ICC Program (e.g., Australia, Singapore, China, Italy, United Kingdom, Denmark, New Zealand, Mexico, Canada, Switzerland, Netherlands, and Portugal). The Division is enthusiastic about the participation of a broader group of international partners.

In 2012, CHE partnered with the International Union of Pure and Applied Chemistry (IUPAC) and the Deutsche Forschungsgemeinschaft (DFG, German Research Foundation), the National Natural Science Foundation of China (NSFC), and the Fundação de Amparo à Pesquisa do Estado de São Paulo (FAPESP, the Sao Paulo Research Foundation) of Brazil to issue an international call for proposals on “Novel Molecular and Supramolecular Theory and Synthesis Approaches for Sustainable Catalysis”. In 2015, representatives from each of the participating countries attended the presentations of the IUPAC awardees at their annual meeting (August 7-14, 2015). This meeting showcased the progress of the investigators and provided CHE with input on potential mechanisms for international collaborations going forward.

Also in 2015, CHE continued its partnership with the lead chemistry funding agencies in Germany, the United Kingdom, Japan, and China in supporting the Chemical Sciences and Society Summit (CS3) series. This forum brought together representatives from the five funding agencies, the five national chemical societies, and scientific delegations from each country in a workshop format. The latest CS3 meeting was held in Leipzig, Germany (September 14-18, 2015) on the topic of water chemistry including sanitation, contamination, analytical techniques to detect/measure contaminants, and emerging techniques for water treatment. This workshop is expected to feed into future IUPAC calls for collaborative proposals. The synergy with NSF's nascent INFEWS Initiative is noteworthy.